



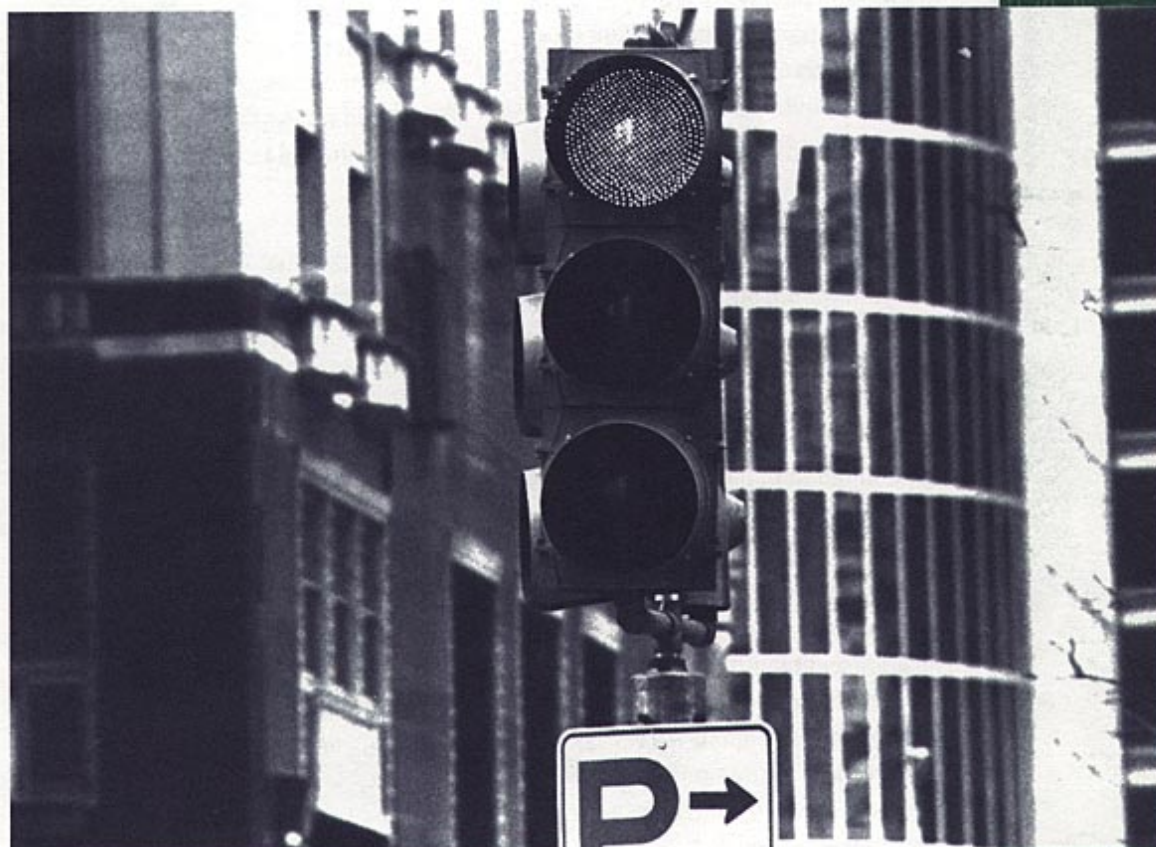
United States
Environmental Protection
Agency

Air and Radiation
(6202)

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APPLICATION PROFILE

LED Traffic Lights



Partner:
City of Philadelphia

Energy Analyst:
John O'Connell, P.E.

PROJECT RESULTS

Energy Savings	83%
Installed Cost	\$39,000
Internal Rate of Return	22%
Simple Payback	4.7 years
Annual kWh Savings	71,508 kWh
Pollution Prevented	
CO ₂	114,413 lbs/yr
SO ₂	1,293 lbs/yr
NO _x	410 lbs/yr

TYPICAL APPLICATIONS

- Red Traffic Signals
- Red Arrow Traffic Signals
- Red Pedestrian Signals
- Orange Pedestrian Signals



Recycled/Recyclable Printed with vegetable oil based ink on paper that contains at least 50% recycled fiber

LED TRAFFIC LIGHTS

Red lights are good for Green Lights

MANUFACTURERS OF LED TRAFFIC SIGNALS

- Dialight
- Ecolux, Inc.
- Econolite
- Electro-Tech's
- Precision Solar
- Relume

Every day, drivers are guided through America's 260,000 controlled intersections by incandescent traffic lights. Yet, few people will view them as an opportunity to manage municipal operating costs. Luckily, some innovative energy managers are investigating the application of light emitting diode (LED) technology to save money and prevent pollution.

LED traffic lights are a good example of innovative use of a familiar technology. For years, LEDs have seen widespread use as a signal source in everything from stereo equipment to x-ray machines. The same robust and optically efficient characteristics that have made LEDs an ideal signal source for common electronics are now being used in reliable, highly-visible, energy-efficient traffic signals.

The potential for energy savings is enormous. In a conventional red arrow, for example, a heavy-duty 150 watt incandescent lamp must be used with a dark red filter and screen to produce a visible red turn signal. An LED system can produce the same visual signal for only 10 watts, a 93% energy savings. Typically operated at 5,250 hours/year (60% of the time), an LED arrow signal can save up to 735 kWh per year.

The potential for maintenance savings is also significant. With an estimated 10-year lifespan, LED signals can greatly reduce relamping costs. Since any form of traffic signal failure demands an immediate maintenance priority, this reliability also greatly reduces emergency spot relamping costs. All major manufacturers offer drop-in assemblies for common traffic and pedestrian signal shapes, allowing fast, flexible upgrading.

Benefits

- Energy savings range from 60-95% depending on the type of signal head replaced.

- The long-life of LEDs minimizes the liability for accidents due to burned-out signals, and contributes to labor savings for routine and emergency relamping.
- LED signals have become more affordable due to advancements in the technology and increasing competition. Eight and 12 inch solid red signals can now be purchased for \$150 to \$200.

Issues

- Check for compliance with local vehicle codes and the Institute of Transportation Engineers standards.
- The effects of operating temperature extremes and input voltage fluctuations on LED's intensity, color, and life need to be carefully assessed.
- LEDs may not be compatible with all intersection signal controllers. The low wattage consumption of LEDs may lead the controller to believe that a lamp has failed. Check with controller manufacturers for compatibility.
- Green and yellow LED traffic signals are under development and promise further savings, but are not yet economically viable.

Call the Green Lights Hotline at 1-888-STAR-YES for addresses and phone numbers of Green Lights Allies.

Red Incandescent

150W



Red LED

25W

150W



10W

75W



12W

CASE STUDY

City of Philadelphia



When approaching a red light in the city of Philadelphia, most drivers will only notice the red signal. However, the Municipal Energy Office of Philadelphia notices high energy savings from their LED traffic light retrofits.

As a pilot study of LED traffic signals, 212 red LED traffic lights were installed at 27 intersections across Philadelphia in late 1993 and early 1994. Eight- and 12-inch red incandescent lamps were replaced with eight- and 12-inch red LED lights. During the 20-month evaluation period, the red LED traffic lights proved to be superior in performance and provide significant energy savings as compared to the incandescent lights.

The installed LEDs save over 71,508 kWh per year, which yields \$8,159 per year in energy and maintenance cost savings, according to John O'Connell, chief engineer for the City. At \$39,000 installed cost, the upgrade will pay back in less than four years. In addition to energy and labor cost savings, the long life of the LED lights help to minimize costly lawsuits resulting from "red signal burn-out" — an expenditure that can greatly exceed the cost of the LED lights.

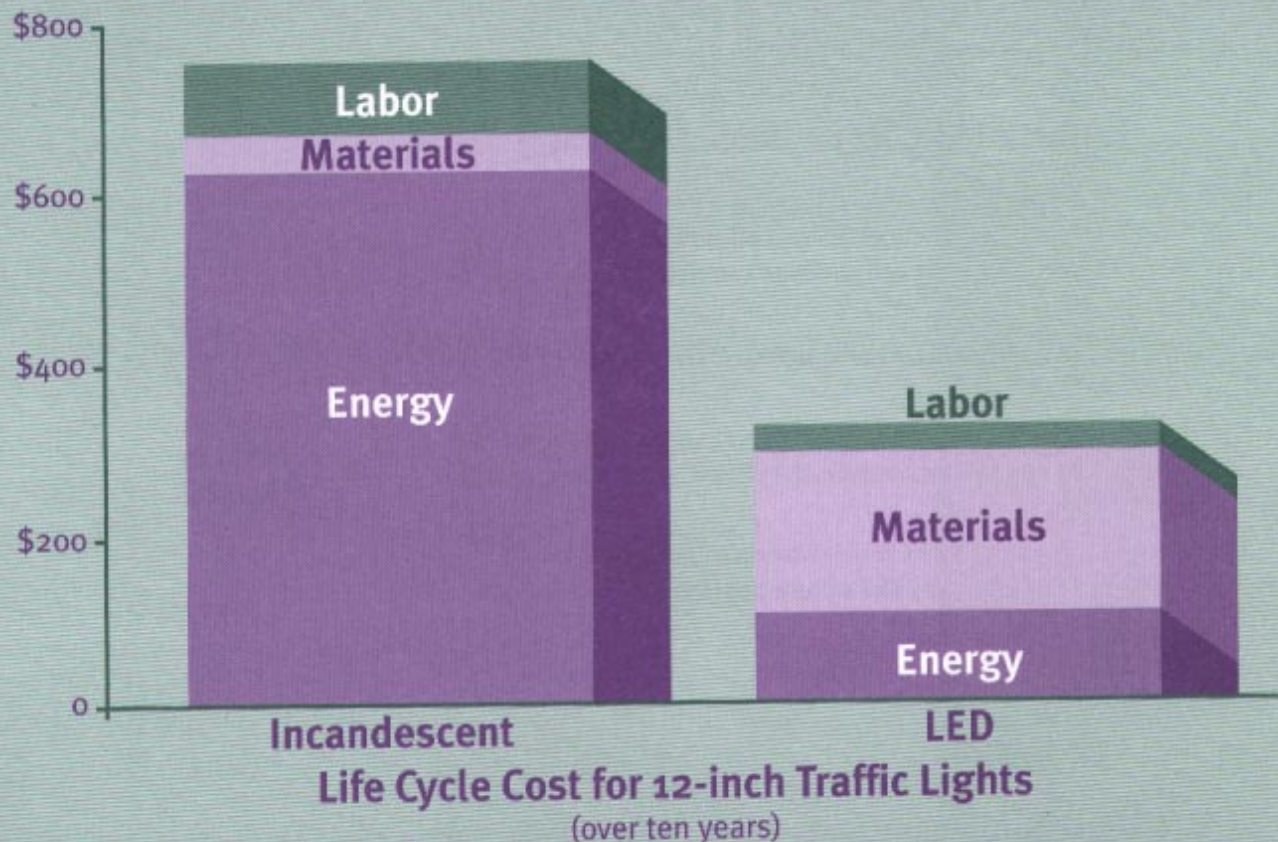
The Municipal Energy Office plans to install red LED traffic lights city-wide. If installed at the City's 2,900 intersections, the LED lights will save over \$850,000 per year in taxpayer money.



Judith Mondre, Executive Director of the Municipal Energy Office, and John O'Connell, Chief Engineer with LED traffic light

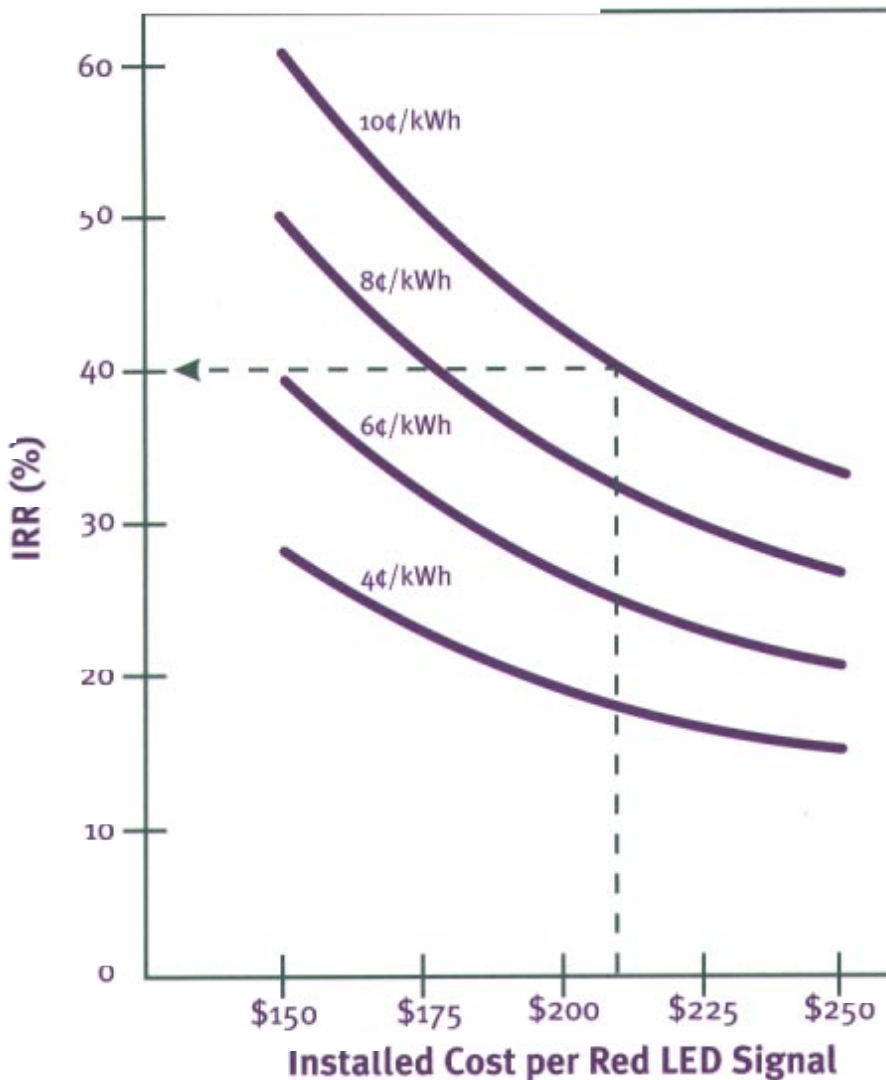
Energy savings of 80 percent or better should give a 'green light' to LED technology.

**- John O'Connell
Chief Engineer
City of Philadelphia**



WILL IT WORK FOR YOU?

COST ANALYSIS FOR RED LED SIGNAL RETROFITS



Use this graph to provide a rough estimate of the cost effectiveness of LED traffic lights. The graph is based on the energy consumption and cost for a 12-inch solid-red LED traffic signal.

1. Determine your installed cost per LED traffic signal. *In our example, the installed cost for one unit is \$210.*
2. Draw a vertical line from this point until it intersects the curve that represents your average electricity rate. *In our example, the electricity rate is 10 cents per kilowatt-hour.*
3. Draw a horizontal line from this point until it intersects the vertical axis that measures the internal rate of return. *Our sample upgrade earns an internal rate of return of 40 percent.*

The Green Lights Program offers 2-day Lighting Upgrade Workshops, Application Profile brochures, and other technical support services to assist program participants in applying cost-saving lighting strategies. For more information, call the Green Lights Hotline at 1-888-STAR-YES.

Graph Assumptions

- Energy consumption based on 150-watt incandescent and 25-watt LED lights operating at 5,256 hours per year.
- IRR based on ten-year analysis
- Incandescent traffic maintenance costs of \$10.40 per year
- 10-year life for LED traffic light